

GRPE Session 13-16 jan 2009

GFV Group

Geneve, 13 Jan 2009

Regulation No. 115 changes

Issues

This presentation tackles the following issues:

1. Scope
2. Emissions test procedure
3. Switch over time
4. Chassis dynamometer setting

Scope

1.4 This Regulation applies to retrofit systems intended to be fitted on

- **petrol vehicles of categories M1 and N1 type-approved pursuant to Regulation No. 83, 05 and later series of amendments;**
- **(petrol and diesel) engines for use in vehicles of categories M and N type-approved pursuant to Regulation No. 49, 04 and later series of amendments;**
- **petrol vehicles of categories M1 and N1 type-approved pursuant to Directive 98/69/EC or later EC Directives and Regulations amending or repealing the Directive 70/220/EC;**
- **(petrol and diesel) engines for use in vehicles of categories M and N type-approved pursuant to Directive 1999/96/EC or later EC Directives and Regulations amending or repealing the Directive 88/77/EC;**

Justification

In order to avoid the long list of exclusions, Aegpl proposes to turn them into a positive description of the application field, including an explicit reference to EC Regulations and Directives.

Emissions test procedure

Non-intrusivity definition

6.1.2.2 In order to prove that the retrofit system is "non intrusive", as defined in paragraph 2.1.5., the system manufacturer shall provide data and/or engineering evaluations which adequately demonstrate that the performance of original air and petrol feed system to the engine are not affected by the installation of the retrofit system. For the approval of a retrofit system as “non-intrusive”, the flow chart provided in figure 1 shall apply.

Justification

AEGPL is firmly convinced that the “non-intrusive” concept should be kept because there are systems that, by design, do not affect the original emission performance of the cars.

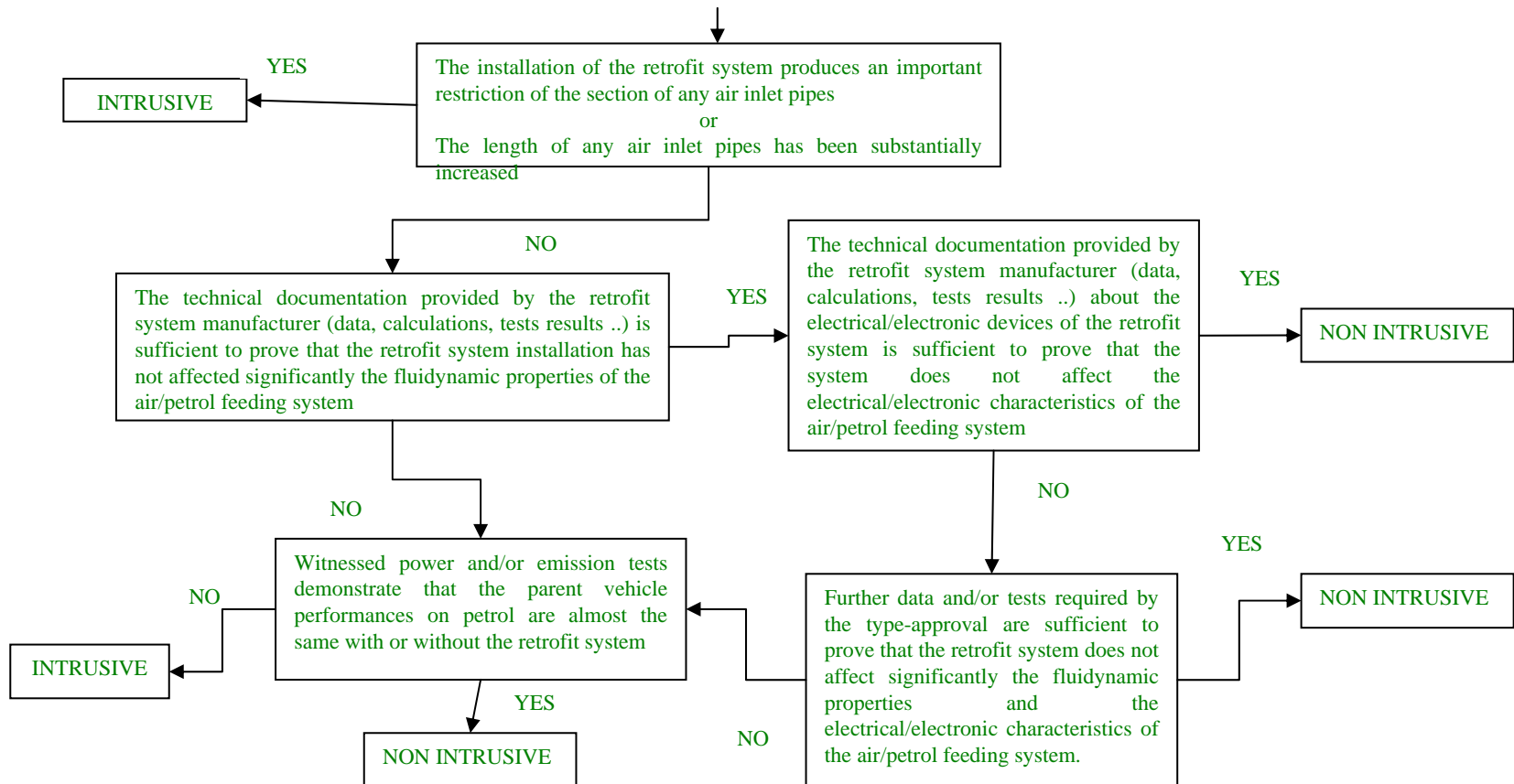
In other words, their mechanical components and electric/electronic devices are designed also with the view to avoiding any disturb to the original petrol cars components and devices.

However, in order to prevent any misinterpretation and to ensure an harmonized approach by all TAA, AEGPL proposes to improve the non-intrusivity definition and, hence, the related characterization assessment.

Emissions test procedure

Non-intrusivity assessment

Figure 1
NON-INTRUSIVE RETROFIT SYSTEM APPROVAL – FLOW CHART



Emissions test procedure

Petrol tests

6.1.2.5.1.3. Subject to the requirements of paragraph 6.1.2.5.1.5. the tests shall be repeated three times with the reference petrol. The test vehicle(s) equipped with the retrofit system, shall comply with the limit values according to the type approval of the vehicle(s) including the deterioration factors applied during the type approval of the vehicle(s).

6.1.2.5.1.4 Notwithstanding the requirements of paragraph 6.1.2.5.1.3., for each pollutant or combination of pollutants, one of the three test results may exceed, by not more than 10 per cent, the limit prescribed, provided the arithmetical mean of the three results is below the prescribed limit. Where the prescribed limits are exceeded for more than one pollutant, it is immaterial whether this occurs in the same test or in different tests.

6.1.2.5.1.5. The number of emission tests prescribed in paragraph 6.1.2.5.1.3. can be reduced in the conditions hereinafter defined:

- only one test is performed if the result obtained for each pollutant subject to limitation is less than or equal to 0.7 the emission limit (i.e. $V1 \leq 0.70 G$);
- only two tests are performed if, for each pollutant subject to limitation the following requirements are met:

$$V1 \leq 0.85 G \text{ and } V1 + V2 \leq 1.70 G \text{ and } V2 \leq G$$

where:

V1: value of the emission of one pollutant obtained from the first test of the Type I performed;

V 2: value of the emission of one pollutant obtained from the second test of the Type I performed;

G: limit value of the emissions of one pollutant (CO/HC/NOx) according to the type approval of the vehicle(s) divided by the deterioration factors.

Notwithstanding the requirements of paragraphs 6.1.2.5.1.2 and 6.1.2.5.1.3, the mono-fuel vehicle may be tested with the reference petrol before the retrofit if tests after the installation of the retrofit system are not possible or may result in false results. The total vehicle mileage between the tests before and after retrofit shall not exceed [200] km.

Emissions test procedure

Petrol tests

Justification

The present procedures both for petrol and LPG tests are more stringent than that required by Regulation No. 83, 05 series of amendments, as fixed in paragraph 5.3.1.4. and in the related Figure 1.

In line with the statement of doc GFV-02-04 regarding the level of stringency of Regulation No 115: *“It is not justified that Regulation 115 should be more restrictive than Regulation 49”*, AEGPL agrees that *“It is not justified that Regulation 115 should be more restrictive than Regulation 83”*

An opposite approach would go well beyond the scope of Regulation N. 115 that – as any other environmental type-approval mandatory scheme – should aim at verifying minimum requirements whose compliance finally allow the sales and the use of the addressed products.

The type-approval pursuant to R. 115 doesn't grant any economic incentive (nor automatically neither indirectly): environmental national incentives are usually designed for specific tasks, based on different environmental needs (PM in some areas, benzene or NOx in others and so on), even not covered by the Regulation 115.

Furthermore, the reasons of the LPG retrofit system purchase can be different from the environmental ones (economic, for instance) and a type-approval Regulation is not permitted to influence it beyond its scope

Emissions test procedure

LPG tests

6.1.2.5.1.4.2. Notwithstanding the requirements of paragraph 6.1.2.5.1.4.3., for each pollutant or combination of pollutants, one of the three test results may exceed, by not more than 10 per cent, the limit prescribed, provided the arithmetical mean of the three results is below the prescribed limit. Where the prescribed limits are exceeded for more than one pollutant, it is immaterial whether this occurs in the same test or in different tests.

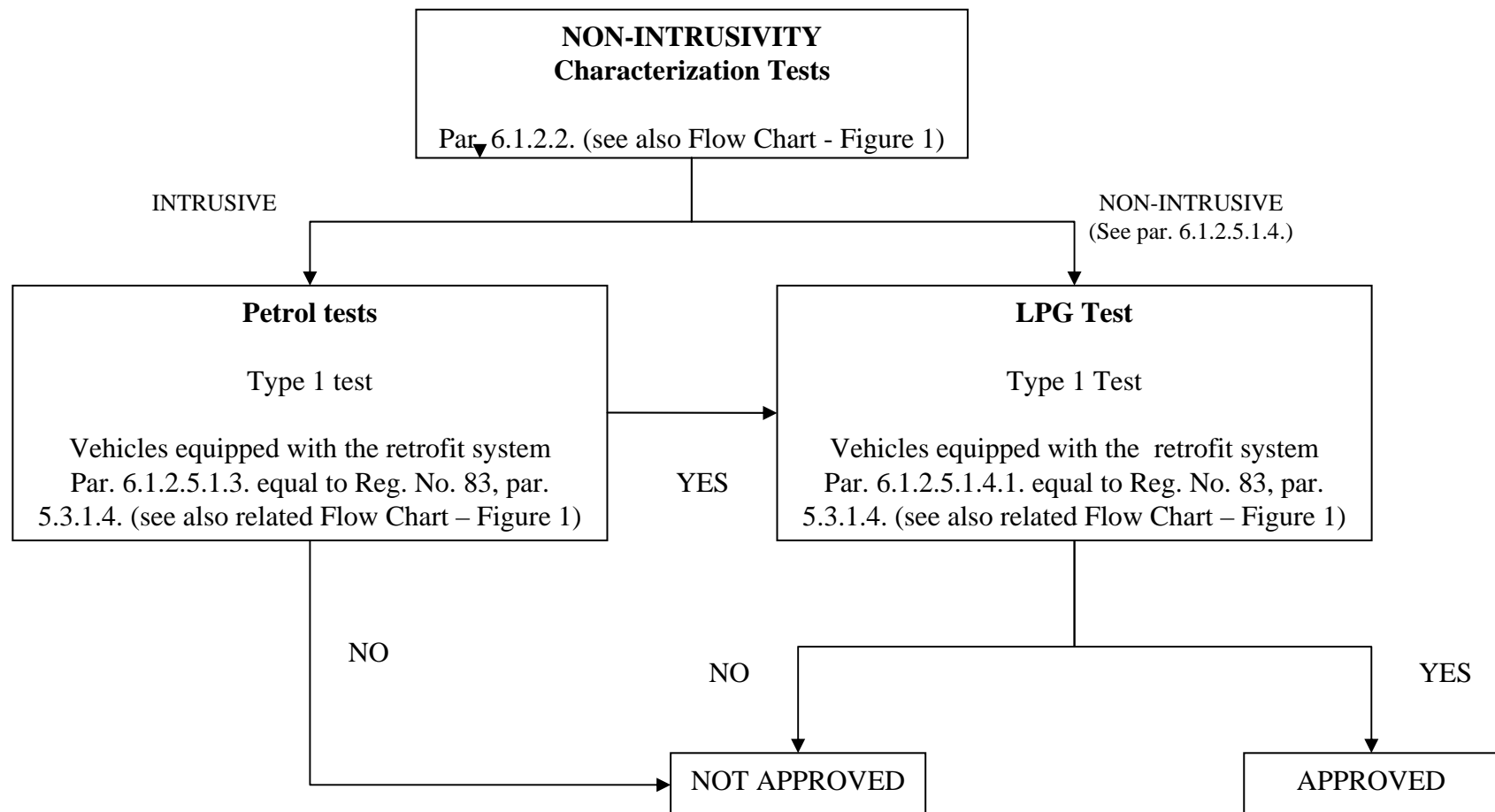
Justification

The proposal aims at ensuring an alignment of the present procedure with the procedure of par. 5.3.1.4. of Regulation No. 83, 05 series of amendments. (see also justification to par. 6.1.2.5.1.5.)

Emissions test procedure

Flow Chart

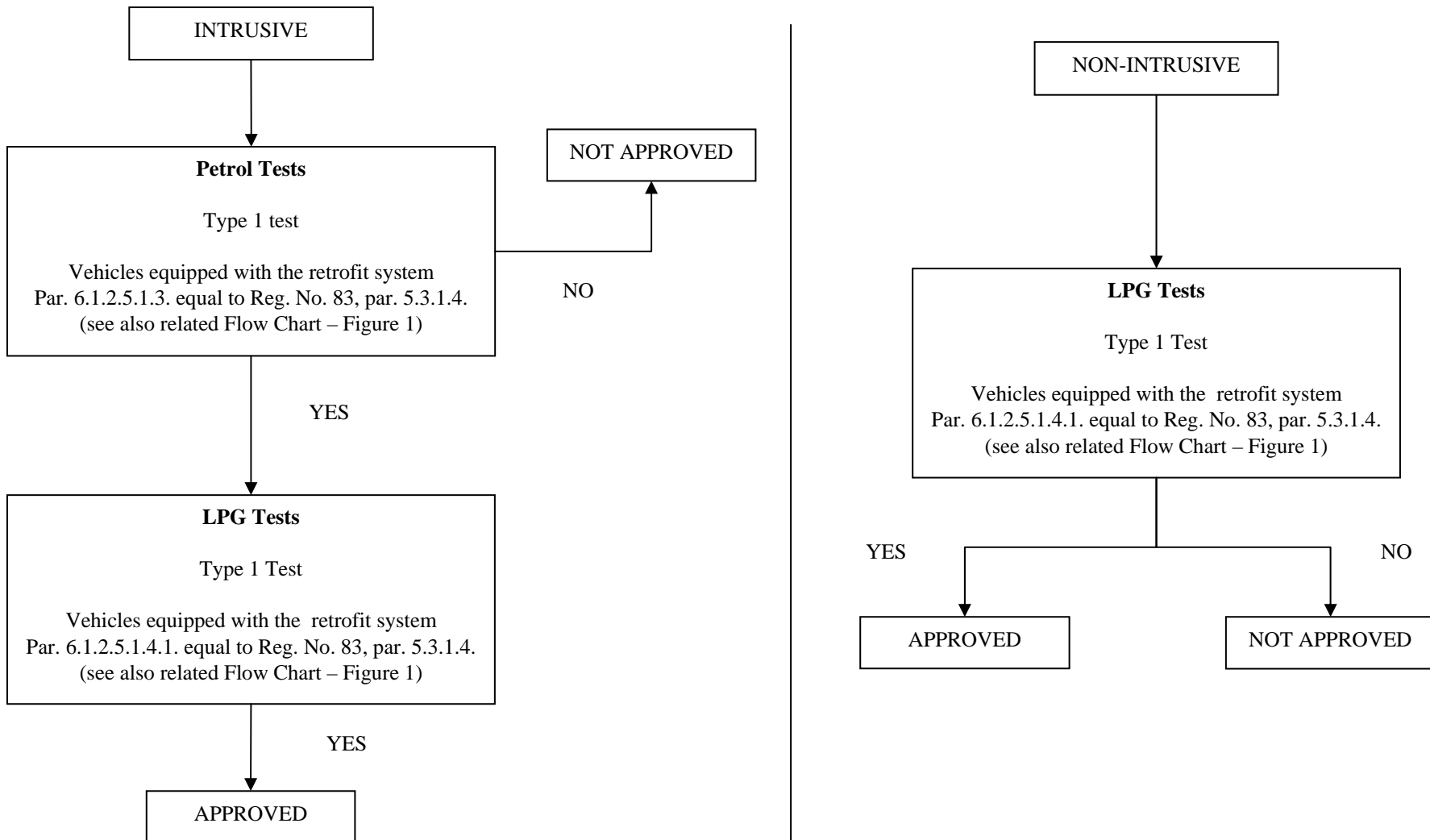
FIRST APPROVAL



Emissions test procedure

Flow Chart

NEXT APPROVALS



Functioning on petrol – max time

6.1.2.5.1.4.1

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If the parent vehicle(s) complies with Regulation No. 83, 05 series of amendments, or with Directive 98/69/EC, or with Regulation No. 49, 04 series of amendments, or with Directive 1999/96/EC, during the type 1 test the vehicle shall only use petrol for a maximum of 90 seconds when operating in gas mode. In the other cases, this period shall not exceed 60 seconds.

Justification

Aegpl agrees to set a maximum timeframe for the functioning on petrol when operating on gas.

This will prevent any gas system from eluding the emission requirements on gas.

As demonstrated in the GFV-02-04, if the switching over petrol is prolonged for most part of the test cycle, the emission on gas are allowed to be even worse than the limits when theoretically extrapolated to the entire cycle.

In other words, during gas feeding time the system can “consume” the “emission gain” accumulated in the petrol functioning, and this could happen for the vast majority of cars as, on petrol, these normally perform rather above the limits.

On the other hand, a right limitation should not imply a worse emission behavior of the car and should, on the contrary, permit a positive synergy between the two fuels.

The proposed timeframes permit - both on LPG and on CNG - to reduce the emissions leaving petrol sharply warp up the catalyst to a temperature suitable to ensuring the highest efficiency for the propane and methane oxidation.

The same arguments were brought to the attention of the European Commission and of the other experts of MVEG when the limit of 60sec was decided for Euro 5/6 cars in the Regulation (CE) 692/2008.

So, our proposal is in line with what was already established for cars native on gas, for which a different design option in the engine/catalyst system could even be taken in order to minimize the activation time of the catalyst for those specific hydrocarbons.

In the end, it worth being highlighted that, within foresaid maximum limit, the system manufacturer will be led to minimize the functioning on petrol as to get the best result in CO2 emission for the specific application, when possible.

Chassis dynamometer setting

Justification

The next table show the cumulative positive brake power (CPBP for here on) of the vehicle (Pegeout 207 1250kg) calculated for both fuels (additional weight: LPG 60kg, CNG 160kg):

	CNG		LPG		
CASE A	3067	100	2935	100	coast-down from manufacturer before retrofit with f_0 corrected; corresponding ECE inertia + gas system weight
CASE B	3336	109	3336	114	ECE table values before retrofit; corresponding ECE inertia
CASE C	3548	116	3415	116	ECE table values before retrofit with f_0 corrected; corresponding ECE inertia + gas system weight
CASE D	3873	126	3649	124	ECE table values of one (LPG) or two (CNG) ref. class above; corresponding ECE inertia of one (LPG) or two (CNG) ref. class above

The case A is to be considered the “real case” because it is based on coast-down of the original car whereas only the rolling resistance have been upgraded linearly according to the new mass of the vehicle. In facts, since the installation of the retrofit system doesn’t affect the original shape of the car, the other coefficients (speed-related) have been left unchanged.

The conclusions are:

- the use of table values corresponding to the vehicle before the retrofit corrected with the additional weight or the use of the table values for the next higher reference mass class would significantly overestimate the influence of the added weight;
- when available, the use of coast-down corresponding to the vehicle before the retrofit corrected with the additional weight would represent the “real case”.
- if coast-down coefficients are not available, the use of table values corresponding to the vehicle before the retrofit slightly overestimate the influence of the added weight but represents the only possible choice.

We must know however that option A is not possible on chassis dynamometers that use a set of flywheels to simulate the vehicle inertia since it is often only possible to select the legislated inertia values. If so, the table values corresponding to the vehicle before the retrofit will apply.

Chassis dynamometer setting

6.1.2.5.1.2. Setting of the dynamometer

Using of coast-down factors/coefficients of the original vehicle:

In case coast-down coefficients of the original vehicle are known, the following conditions shall apply:

- the parent vehicle mass shall be measured with the retrofit system installed on the vehicle including the LPG tank fully filled up or shall be calculated as the sum of the original vehicle reference mass and the mass of the retrofit system with the LPG tank fully filled up;
- the rolling resistance of the parent vehicle shall correspond to the original vehicle value proportionally adjusted to the parent vehicle mass measured or calculated as above:

f_0 correction formula: $f_0' = f_0 + (\text{abs}(f_0)) * (p/m)$

where

m=reference mass of the original parent vehicle;

p= retrofit system mass;

- the other coefficients of the resistance of the parent vehicle shall be equal to that of the original vehicle.

Using of the table values:

The setting of the dynamometer shall comply with requirements of Regulation 83 according to the reference mass of the original vehicle.

In both cases, the approval granted is valid also for any retrofit system that implies vehicle's different reference mass requiring the use of the next two higher equivalent inertia categories or any lower equivalent inertia category.